18th CONGRESS,
2d SESSION.

LETTER

FROM

THE SECRETARY OF THE TREASURY,

TRANSMITTING INFORMATION COLLECTED BY THE DEPARTMENT,

UPON THE SUBJECT OF

Accidents on board of Steam Boats.

JANUARY 31, 1825,
Read, and ordered to lie upon the table.

WASHINGTON:
PRINTED BY GALES & SEATON.
1825.

TREASURY DEPARTMENT, *Jan.* 31, 1825.

SIR: In obedience to a resolution of the House of Representatives, directing the Secretary of the Treasury to inquire and report to the House, the causes of the fatal disasters which have so frequently happened on board of Steam Boats, I have the honor to submit the enclosed correspondence, which contains all the information collected by the Department upon the subject referred to by the said resolution.

I am of opinion, that legislative enactments are calculated to do mischief, rather than prevent it, except such as subject the owners and managers of those boats to suitable penalties in case of disasters, which cannot fail to render the masters and engineers more attentive, and the owners more particular in the selection of those officers.

I have the honor to be,

Your most obedient servant,

WM. H. CRAWFORD.

Hon. HENRY CLAY,

Speaker of the House of Representatives.

CIRCULAR TO COLLECTORS.

TREASURY DEPARTMENT,
July 15th, 1824.

SIR: I am directed by the Secretary of the Treasury to request that you will address one of the enclosed circulars, after being signed by you, to each of the most intelligent and experienced masters of steam boats belonging to, or frequenting, your port, and to transmit their answers to this office. The blanks left for the date, and the name of the captain, and of the steam boat, are to be filled by you.

I am, very respectfully,
Your obedient servant,
EDWARD JONES, *Chief Clerk.*

Collector of ——

July —, 1824.

SIR: I am instructed by the Secretary of the Treasury to request, that you will have the goodness to enable him to comply with the object of the annexed resolution of the House of Representatives, by favoring me, in writing, with the result of your experience as to the material causes of those fatal disasters which have so frequently occurred on board of steam boats in the waters of the United States, and what regulations may, in your opinion, afford better security to the lives of passengers and crews.

I am, respectfully,
Your obedient servant,
—— —— *Collector.*

To Captain —— ——,
of the Steam Boat ——.

CONGRESS OF THE UNITED STATES,

IN THE HOUSE OF REPRESENTATIVES,

May 26th, 1824.

Resolved, That the Secretary of the Treasury be instructed to inquire and report to this House, at the commencement of the next session of Congress, what are the material causes of those fatal disasters which have so frequently occurred on board steam boats in the waters of the United States. and what regulations may, in his opinion, afford better security to the lives of passengers and crews; and, for the

purpose of this inquiry, the Secretary is hereby authorized to call to his assistance the knowledge and experience of engineers and others, skilled in navigating and constructing vessels propelled by fire or steam.

Attest, MATTHEW ST. CLAIR CLARKE,
Clerk of the House of Representatives U. States.

CUSTOM-HOUSE, COLLECTOR'S OFFICE,
SAVANNAH, 1*st September*, 1824.

SIR: Inclosed is a report from Captain Walter Dubois, master of the steam-boat Georgia, on the subject referred to in your circular of 15th July last; also the report* made, and part of the evidence taken, by a committee of the British Parliament on the same subject.

Respectfully,
Your obedient servant,

N. H. OLMSTEAD, *Dy. Coll.*

The Hon. WILLIAM H. CRAWFORD.

Having been in command of a steam-boat, in the Savannah river, for five years past, I have never known an accident of bursting a boiler with any of the steam-boats owned by the Steam Boat Company of Georgia. Our engines are on the low pressure principle, carrying from five to six pounds of steam to the square inch. I think it impossible to burst, carrying this quantity of steam, with a safety-valve sufficiently large, and proper attention paid to it. We have had several very fair proofs of our safety in carrying this quantity of steam. We have taken out of different boats three pair of boilers that, when hoisted out, were completely worn through in many places. Having defective parts of the boilers in the bottom of the boat, our boilers frequently wear very thin in places and crack, and the water runs out without any force at all. I am satisfied there is not force of steam enough in the boilers to burst them, carrying this quantity of steam. We can propel our boats from seven to eight knots through the water; boats of 110 feet on deck, 26 feet beam, engines of 32 horse power. There are many low pressure engines, in the United States, that carry too much steam; more than their boilers can bear for a length of time: they are therefore liable to bursting. I have no doubt but there are some of our engineers in the United States who carry more steam on their

* For the Report, see end of the Document.

engines than their air-pumps are able to condense fast enough: it therefore becomes an unnecessary strain on the boilers, and the boat goes no faster through the water. I know it has been the case with our Georgia boats. We have reduced our steam from what we formerly carried, and we find we go quite as fast. In order to prevent accidents, I should recommend never to carry more than from seven to eight pounds to the square inch, and a safety valve sufficiently large; likewise, the boilers made sufficiently strong with stay-bolts.

Carrying this quantity of steam, and paying proper attention to the safety-valve when the engine is stopt, or moving slowly, I am convinced no boilers can ever burst.

Your humble servant,

WALTER DUBOIS,
Master of the steam-boat Georgia, of Savannah.

To JOHN STEVENS, Esq. *Collector.*

SURVEYOR'S OFFICE,
Port of Louisville, October 15, 1824.

SIR: In conformity with your desire, expressed in your letter of 13th August, I have forwarded and delivered the circulars to several gentlemen conversant in the matter to which they advert. Dr. Buchanan, who stands high as an experimentalist on steam, is among those whom I have addressed, and his opinion will be the result of actual experiment on a boat of his, which is now progressing to completion. Enclosed is the communication of Mr. David Prentice, of this town, a gentleman of considerable mechanical ingenuity, and whom I have selected, for the purpose of contrasting opinion with Dr. Buchanan, to whom he is speculatively an opponent. The answer of Captain Shallcross, of the steam boat Favorite, is likewise enclosed. The other gentlemen to whom the circulars have been addressed, are as follows:

Captain Tyson, steam boat Paragon.
" Miller, do. Olive Branch.
" H. M. Shreve, now at Cincinnati.
" Beckwith, steam boat Phœnix.
" Pearce, do. Rob Roy.
" Sheader, do. General Pike.
" Armstrong, do. Mexico.

You will find, also, the surrendered papers of the steam boat Fayette, condemned and burnt a few days since, on the beach at Upper Portland, by her owners, and am,

Respectfully, Sir, your obedient servant,

RICHARD FERGUSON.

BEVERLY CHEW, Esq.
New Orleans.

COLLECTOR'S OFFICE,
District of Alexandria, Dec. 30, 1824.

SIR: In obedience to your instructions of the 15th of July, the printed circular letters therein enclosed, were filled up and handed to the captains of the two principal steam boats that belong to this port. From Captain Jenkins, of the steam boat Potomac, the enclosed letter was this day received. No answer has been received from the Captain of the Washington.

Most respectfully, I am, Sir,
Your most obedient servant,
HUMPHREY PEAKE, *Collector.*

Hon. WM. H. CRAWFORD,
Secretary of the Treasury, Washington.

ALEXANDRIA, *December* 22, 1824.

SIR: In conformity with the request of the Secretary of the Treasury, which came immediately through you, I am happy to give you every information (as far as my knowledge extends) regarding the causes of certain disasters which have so frequently occurred in the navigation of steam boats throughout the waters of the United States.

The steam boilers on the low pressure system, frequently burst, in consequence of a particular kind of sediment settling on the bottoms of the boiler, and thereby prevents the water acting on the boiler in a proper manner. The copper becomes heated in an uncommon degree, and consequently bursts from that cause. I have known several instances immediately under my knowledge, where the boilers of the low pressure have burst, and never in one instance has any injury been sustained by any individual on board. It is necessary to have the safety valve examined often, on account of the rust that collects, and prevents the valve opening. I have found it essential that water should be kept regular in the boilers, as in many instances from the neg ect of the engineer in attending to that particular, the water gets reduced in the boiler; the boiler consequently becomes heated and bursts. The attention of an engineer should be turned at certain short periods to the examination of the strength of their respective boilers, by trying the boilers by double its power, every three or four months. As it respects engines of high pressure, I am convinced that they are dangerous in the extreme, from their peculiar construction, as well as the experience we have often had, in the fatal disasters which have occurred, some of them recently.

These remarks have been hastily drawn up, and therefore I shall always feel myself bound to give you any other information in my power, when called on.

Respectfully yours,
URIAH JENKINS.

To HUMPHREY PEAKE, Esq.
Collector of the Customs in the port of Alexandria.

CUSTOM HOUSE, BALTIMORE,
Collector's Office, Dec. 1, 1824.

SIR: Within is a report received to-day from the Commanders and Engineers of Steam Boats in this district, which is transmitted agreeably to your circular directions of the 15th July current.

I am, sir, respectfully,
Your obedient servant,
JAS. H. McCULLOCH.

WM. H. CRAWFORD, Esq.

Copy of a letter to the Collector from the Commanders and Engineers of Steam-boats in the district, dated

STEAM BOAT MARYLAND,
November 1st, 1824.

SIR: We have received your circular letters of the 26th July last, annexing a resolution of the House of Representatives of the 26th May preceding, and requesting us, in conformity with its provisions, "to favor you with the result of our experience, as to the material causes of those fatal disasters which have so frequently occurred on board of steam boats in the waters of the United States, and what regulations may, in our opinion, afford better security to the lives of passengers and crews."

In answer to these inquiries, we consider ourselves authorized by the attention which has been given, and the observations made, by us, with regard to the engine and machinery on board our respective vessels, to state, that the best security against the disasters which so frequently occur in boats of this description are the following:

To have a well constructed engine with all its machinery in perfect order, made of sound materials, and its flues and boilers previously tried and put to full proof;

To ascertain the elevation of steam which shall sufficiently and safely propel the machinery, and never to exceed it;

To keep the flues and such parts of the boilers as may be in contact with the fire, always covered with water;

To examine the condition of the flues and boilers at stated times, not less than once in two or three weeks, and see, or be assured, that every part is free from flaws, sediments, or other matter, which might expose to danger;

And to employ an engineer, skilful, honest, sober, and attentive; and to keep a watchful eye over the conduct and movements of all the hands engaged about the management and service of the whole engine.

If these precautions and regulations be really competent to secure the lives of passengers and crews from danger and disasters, it would seem to follow, that the unfortunate accidents which have so often taken place ought to be attributed to the want of due attention to these particulars, or to some of them. It is probable that the principal causes of these misfortunes have been some unperceived defect in the condition of the flues or boilers, or the use of a higher elevation of steam than prudence would have justified. In the spirit of emulation, which, perhaps, has sometimes produced this excess, the application of additional fuel may not always be counteracted by an equal supply of water: and hence, some part of the flue or boiler may become exposed to a violent heat without being covered by what might be an adequate protection.

While the vessel is preparing for her departure from her port, or while she is stopped at an intermediate place for landing or receiving passengers, the process for forming steam continues, and the steam is retained in the boiler, except that portion which the safety valve usually discharges. In this situation, and until permitted to propel the machinery, it appears indispensably necessary to let off all the surplus steam; otherwise the boiler must be considerably forced and endangered. And it may deserve to be considered, whether the boiler may not have been so weakened or affected by an extraordinary pressure of steam, where the discharge of it has been incautiously neglected while the boat was stationary, as to have been a promoting, though not the immediate, cause of its subsequent explosion.

We are, sir,
Very respectfully,
Your obedient servants,

CLEMENT VICKARS, *Commander* } *of steam boat*
DUNCAN McCULLOUCH, *Engineer* } *Maryland.*
EDWARD TRIPPE, *Commander* } *of steam boat*
BENJAMIN LEDDOR, *Engineer* } *United States.*
WILLIAM OWEN, *Commander* } *of steam boat*
THOMAS WILKINSON, *Engineer* } *Norfolk.*
JOHN FERGUSON, *Commander* } *of steam boat*
JAMES WEAVER, *Engineer* } *Virginia.*

To James H. McCulloch, Esq.
Collector of the port of Baltimore.

Collector's Office,
New Orleans, September 22, 1824.

Sir: I duly received Mr. Jones' letter of the 15th July last, inclosing circulars for the masters of steam boats belonging to or frequenting this port, which were, after being signed by me, addressed to the

most intelligent and experienced in navigating vessels propelled by steam.

I have, as yet, received an answer from one of the commanders only, which, I conclude, it is best to forward without delay, and shall do the same with any others that may reach me.

Most, if not all, the steam boats belonging to the upper ports on the Ohio and Tennessee being, at present, in those rivers waiting for the fall floods, I have forwarded a sufficient number of circulars to these places.

I beg leave to add, that, since the year 1813, there has been enrolled and licensed at this office 125 steam boats measuring 23,834 52/95 tons. Since that time, sixty-five boats have been either worn out, lost, destroyed by fire, sunk, or changed districts, amounting to 13,005 4/95 tons, leaving sixty boats employed on the western waters, not including some on the upper waters which do not frequent this port, the tonnage of which is 10,829 43/95 tons.

I have the honor to be, with great respect,
Sir, your most obedient servant,
BEVERLY CHEW.

The Hon. WILLIAM H. CRAWFORD,
Secretary of the Treasury, Washington City.

NEW ORLEANS, 1824.

SIR: I have the honor to acknowledge the receipt of your letter of the 11th August, requesting me to afford such information as my experience will enable me to, "as to the material causes of those fatal disasters which have so frequently occurred on board of the steam boats in the waters of the United States," &c.

Deeply sensible of the distressing consequence of the disasters alluded to, I lose no time in giving you my opinions, with such facts in the history of steam navigation upon the Mississippi and its tributaries, as I have become acquainted with. My information has been derived from various sources, and, I believe, may be relied upon as nearly, if not entirely, correct.

The resolution of Congress, under which you make the inquiry, I presume, was produced by the melancholy accident on board the Ætna, near New-York. In the debates upon the subject, and the con current newspaper publications, it appears that the weight of conse quences were attempted to be placed upon the use of what are called *high pressure* engines.

Having, for five years, been in command of steam boats furnished with engines of that description; and a great majority of the boats employed upon these waters being of the same description; and being also fully satisfied, that that form of engine possesses many advantages over the low pressure for the purposes of navigation, I have taken

the liberty to offer to you a statement of facts, that will prove they are as little liable to accidents as the other, and, when properly attended to, are, in all respects, as safe.

From the expansive power of steam, it is not probable that a boiler of a steam engine for propelling vessels can be so strongly constructed, as not to be overcome by any force of steam that may be applied. It will, therefore, be always necessary for them to be furnished with safety valves, that will relieve the boiler and engine before so great a power shall be applied as to produce rupture.

This precaution has generally been adopted; but frequently in a very careless or inadequate manner.

I conceive, that, in the construction of safety valves, it will be necessary, to make them answer their intended purpose, that they should have a sufficient vent to let off the steam as fast as it may be generated; that it should be so situated, as not to be liable to be encumbered either by the carelessness of the engineer, or the meddling officiousness of passengers or other persons; and that, when there are a plurality of boilers, there ought to be one distinctly to each, so that should any obstruction occur in the connecting tubes, relief would still be certain. Perhaps it would be well that those valves should be placed entirely beyond the control of the engineer, and that when having been properly regulated, they should be locked up and the key placed in the special possession of the captain.

Whenever these regulations shall have been carefully adopted, bursting from the force of steam will not take place, unless the water is permitted to get below the upper surface of the flue: then, the iron uncovered by water will become so hot as to lose its tenacity; the flue will collapse, or burst inwards, and the water and steam pass off through the furnace. Several accidents of this kind have occurred.

The most destructive and tremendous explosions that have occurred, such as that of the Ætna, near New-York, a boat upon the Thames, near London, the steam mills at Pittsburg, &c., I believe, have been produced by another and much more efficient power than steam.

It is known to chemists, that when the steam of water is exposed to the surface of iron heated a little above a red heat, the water becomes decomposed, and an evolution of gas takes place, that produces an explosion quite equal in violence to gunpowder.

At Pittsburg, the boiler was projected several feet in the air above the large house which contained it. The explosion on board the Ætna was, if newspaper statements can be relied upon, evidently produced by another power than steam. In the explosion upon the Thames, the boiler flew off like a rocket.

Hence, I believe that, whenever the water shall be suffered to get below the surface of the flue, or any other part of the boiler to which the fire shall be directly applied for a length of time, or until the requisite degree of heat shall take place, such an explosion will occur; and hence I think that no form of boiler yet invented is secure against this kind of accident, if the precautions above stated are not observed.

To avert these accidents, I beg leave to suggest the following additions to engines, viz: a water guage, so graduated and constructed,

as to point out upon a *dial plate* like that of a clock or compass, the precise quantity of water in the boiler, or in each boiler, where there are more than one; in addition to which, should be fixed an apparatus that would ring a bell whenever the water should fall below a certain point.

The mode of constructing these apparatus will be easily devised by any good mechanist.

With these precautions and improvements, I think steam boats may be rendered much more safe than they are at present.

I beg leave to observe, that, as they have heretofore been constructed, they have afforded the safest mode of conveyance yet used. It has been estimated, from data considered nearly accurate, that, since the introduction of steam boats upon the Mississippi and its tributary streams, about one million of persons have used them for the purpose of personal transportation; out of which number, only fifty-six have been destroyed by accidents peculiarly produced by steam.

From the annexed schedule of accidents, from bursting of boilers of steam boats upon these waters, it will be observed that there have occurred, altogether, eleven such accidents, four of which have been on board those boats that were furnished with high pressure engines, and seven on board those with low pressure.

From the list of boats of each description that have been employed, it will be observed that the general inference affords no reasonable grounds for proscribing high pressure engines.

If Congress shall determine to legislate upon this subject, I will beg leave to suggest, that, to ensure the capacity of engineers, it be enacted, that there shall be established a *board* of competent persons to examine all those who wish to be employed as engineers, and particularly ascertain their qualifications; and, when found competent, give them a license, without which no one shall be employed.

As it is necessary in the long voyages upon these waters, that there should be an assistant, or second engineer, whose qualifications need not be as perfect as the first, or principal, there may be two classes of them, designated as first, and second, or by any other appropriate appellation.

Most respectfully, your humble servant,

STEPHEN VAIL.

BEVERLEY CHEW, Esq.

List of accidents from bursting of boilers, on board of steam boats, upon the Mississippi, and its tributaries.

1817. WASHINGTON—high steam engine, burst her boiler whilst laying by raising steam; killed 13 persons.

1818. CONSTITUTION—high steam engine; laying by to repair a wheel, and holding on steam; killed 13 persons.

1819. HECLA—low steam engine; stopped to raise a strong head of steam to pass a rapid current; killed one, and one dangerously wounded.

1822. HECLA—laying by raising steam; killed six persons, and scalded several others severely.

1821. VOLCANO—low steam engine; laying by to land a passenger; killed three persons.

1819. FELICIANA—low steam engine; on her passage from Philadelphia to New Orleans; killed one person.

1822. GENERAL ROBINSON—high steam engine; stopped to raise steam to pass a strong current in the Cumberland; killed 9 persons.

1822. ALABAMA—low steam engine; stopped her engine to make fast to a ship; killed two persons.

1823. COURIER—low steam; engine stopped whilst getting up an anchor; killed one person.

1823. YANKEE—high steam engine; laying by with high steam up; killed three persons.

1823. ARKANSAW—low steam engine; stopped at the rapids in Red river; killed three persons.

The above statement has been made out from the reports of several persons, and is believed to be nearly, if not exactly correct.

*List of Steam Boats that have been employed on these waters, with the kind of engine by which they were propelled. Those marked * are now out of service.*

LOW PRESSURE.

* Orleans,	Robert Fulton,	* Shelby,
* Vesuvius,	* General Green,	Tennessee,
* Ætna,	Henderson,	Teche,
* Alabama,	Hecla,	* United States,
* Alexandria,	* Kentucky,	Volcano,
* Arkansaw,	Louisianian,	* Velocipede,
* Beaver,	Maid of Orleans,	Magnet,
Columbus,	Manhattan,	Caledonia,
Courier,	Mississippi,	Balize,
Henry Clay,	* Mobile,	Natchez,
Eagle,	Neptune,	* New Orleans,
Fidelity,	Paragon,	* Hope,
Feliciana,	Ramapo,	Velocipede,.....39.

HIGH PRESSURE.

* Enterprise,	* General Clarke,	* Frankfort,
* Comet,	* Calhoun,	Favorite,
* Washington,	Cumberland,	* Fayette,
* Despatch,	* Comet,	* Firefly,
* Franklin,	Dolphin,	* Harriet,
* Buffaloe,	Exchange,	* General Harrison,
* Henry Baldwin,	Expedition,	* Hero,
* Cincinnatti,	Elizabeth,	* Independence,
* Car of Commerce,	* Eliza,	* Johnson,
* Constitution,	Eliza,	* Thomas Jefferson,

* General Jackson,
Robert Thomson,
St. Louis Packet,
* Mars,
* James Monroe,
* Madison,
Maysville,
Missouri,
* Missouri Packet,
Mandan,
* Napoleon,
Nashville,
General Neville,
* Ohio,
Olive Branch,
* Osage,
* Perseverance,
* General Pike,
Providence,
Post Boy,
Rifleman,
* James Ross,
* Rapide,
* General Robinson,
* Rumney,
Rocket,
Miami,
Pike,
Louisville,
Mechanic,
Spartan,
Pittsburg,
Bell Creole,
* Telegraph,
* Telegraph,
* Sidney,
* Tamerlane,
* Vesta,
* Vulcan,
* Virginia,
* Vista,
* Western Engineer,
Wheeling Packet,
* Yankee,
Andrew Jackson,
Rob Roy,
President,
Rambler,
Eclipse,
Phœnix,
Riego,
Superior,
Pennsylvania,
Plough Boy,
Lawrence,
Leopard,
Scioto,
Steubenville,
* Experiment,
Enterprise,
Hornet,
Pittsburg, & St. Louis' Packet.....92.

COLLECTOR'S OFFICE,

New Orleans, 8th November, 1824.

SIR: I transmitted, under date of the 22d September last, a letter received by me from Captain Vail, master of the steam-boat Rob Roy, in answer to the circular letter addressed to him relative to the causes of those fatal disasters which have so frequently occurred on board of steam-boats. I have this moment received two others from the masters of boats laying at Louisville, which I hasten to forward you; and shall do the same with any others that may reach me in time.

I have the honor to be,
With great consideration and respect, Sir,
Your most obedient servant.
BEV. CHEW.

The Hon. WM. H. CRAWFORD,
Secretary of the Treasury, Washington City.

LOUISVILLE,
September 10th, 1824.

SIR: In compliance with the request contained in your circular of the 14th August, I give you my opinion as to the causes of the explo-

sions that have taken place on board of Steam boats, and also, as to the means that may be employed to prevent their recurrence.

The first and most obvious cause of a boiler's bursting, is from weakness. This may be occasioned by using improper materials; making it of a bad shape; from bad workmanship, or from age. To prevent danger from this defect, it would be necessary to try the boiler with a pressure greater than they are intended to be wrought with when at work, and to repeat this trial periodically. It is not necessary to do this with steam which would be dangerous; for a pressure to any extent can be given with water, by using the common force pump belonging to the engine.

Another cause of explosion, is over loading the safety valve, by using more weight on it than the boiler was intended to work with. This is a very common and very dangerous practice, and is the more to be reprehended, that, most commonly, it is of no manner of use. There can no advantage be gained by using more weight on the valve than is just sufficient to confine the steam that can be made by the boiler, *when the engine is working freely;* yet many boats have safety valves loaded with twice as much weight as the steam can raise when the boat is under way, and of course strain their boilers much more than is necessary. It is from this cause that almost all the explosions which have taken place, have been at a time when the engine was not at work. It is evident that this would not be the case, if the pressure of steam was not greater than was necessary to run the boat. To prevent danger from this cause, is not very easy to be done. Engineers, and even captains of steam boats, have a great propensity to overload their safety valves. It enables them to make a show of great speed at leaving a port, which gratifies their vanity.

Some have proposed to have a secondary valve, locked up from the engineer; but in the Mississippi this will not answer the purpose. The fine clay suspended in the water, is of so adhesive a quality, that it will in a manner glue down a valve that is not frequently raised. The only certain method I know of, or would recommend, is that of a mercurial guage, so contrived that the steam would blow the mercury out at the top of the pipe, when it became too high for safety.

The last cause is from neglect of the engineer, in allowing the water to get too low in the boilers, so that the tops of the flues become uncovered, and exposed to the action of the fire, which softens them until they are easily crushed together by the steam. A rivet of tin or lead inserted in the part first uncovered, will effectually prevent this danger, by melting out and making a large leak, which will compel notice to be taken of it.

All of these plans have been proposed by others, here and in England, and I adopt them as being the best I know of. But though I propose them in compliance with the wishes of the Secretary of the Treasury, yet I will take the liberty to say, that I am doubtful if these or any other plans that might be adopted by the legislature, would lessen the danger of explosions. No accident of this kind has taken place on these waters for two years past, and this is to be ac-

counted for by the very great increase of knowledge on the subject, amongst the engineers, captains, and owners of the boats, and, also, from the powerful motives of competition, exciting them to do all in their power to gain a good name for their boat. I state this to show, that, on our waters, but little danger from explosion is to be apprehended at this time, nor much need of laws to lessen the danger. But I am afraid that any interference on the part of the Legislature may actually *increase the danger*. At present, the engineer is, in a great measure, considered responsible for any accident of this kind that may happen. He is acted on by every motive that can influence a man to do his very best. But if enactments are made, which lessen this responsibility, either really, or in his estimation, he will slacken his diligence and attention. In case of accident, he will shift the blame from himself upon the legislature, and his friends will believe he has a right to do so. There is also a certainty that engineers will resent any interference with their absolute rule of their engines, and some of them are not at all unlikely to encourage (if the term may be used,) their boilers to burst, to throw odium on the law.

I am, Sir,
Yours, respectfully,
DAVID PRENTICE.

BEVERLY CHEW, Esq. *Collector New Orleans.*

LOUISVILLE, Ky. *October* 3, 1824.

SIR: I received, a few days ago, from Dr. Richard Ferguson, a circular, with your signature attached to it, requesting my opinion of the causes which so frequently occur of the bursting of steam-boat boilers, in the waters of the United States, which is generally so fatal to passengers and crews of said boats; likewise, my opinion of what may be necessary to afford them greater security.

I have been navigating, by steam-boats, the Mississippi and Ohio rivers for the last eight years, in various capacities, and have paid particular attention to the engine department. I have observed, with regret, the frequent accidents that occur, most undoubtedly caused by the ignorance or negligence of the engineer. By ignorance, in not knowing what pressure of steam, to the square inch, there is in the boilers—from not knowing how to regulate the safety valve, by placing on it a given quantity of weight to confine the steam to a certain pressure in the boiler, whether for a low or high pressure engine. By negligence, in allowing the water to get too low in the boilers, which exposes that part of the boiler to the fire that is not covered with water; the iron, or the part of the boiler exposed, consequently becomes hot and malleable, and, of course, gives way to the pressure of steam contained in the boiler, the consequences of which have so frequently been fatal to passengers and crews of steam boats. The accidents that occur, are much more frequent from this

cause than any other; although they are sometimes occasioned by there not being proper attention paid to keeping the boilers cleansed of the great quantities of mud which passes into them, while supplying them with the Mississippi water, which is sometimes so muddy that the boilers require cleaning out once or twice in a trip from New Orleans to Louisville. If the boat should stop several hours, while there is much mud in the boilers, it settles to the bottom, while not kept in motion by the heat, and, when the fire is again applied, the mud becomes so baked as to prevent the water from acting on that part of the boiler; the consequences are the same as by the Engineer suffering the water to get too low in the boiler. In boats, navigating by steam, the ocean or salt water rivers, the same accidents occur, from the salt or saline substance which forms in them by heat, and adheres to the sides or bottom of the boiler—more frequently if they are made of iron, which should never be used for steam boilers in salt water.

The safety valve being the only regulator or guage we can have on high pressure engines, I conceive it necessary to have two of them. In having only one valve, serious accidents have ocurred by weights being carelessly placed on them, which has occasioned the bursting of the boiler and the loss of many lives. In having two safety valves, both should be equally and accurately loaded, and that one of them, at least, should be confined, that none but the Engineer or Master of the boat should have access to it, I think is essentially necessary for the preservation of passengers and crews of steam-boats.

Another important consideration is, to know what pressure the boiler will bear with safety, and every Engineer or Master of a steam boat have it in their power to prove them by the following simple method: Every steam engine on board of a boat must have a force pump, for they cannot, like Bolton and Watts's method of supplying their boilers in their low pressure engines, by a float stone, which epens or shuts a regulating valve, as more or less water is required, they having a column of water sufficient to counteract the pressure of steam that may be in the boiler. It would take a pipe as long as the mainmast of a ship to counteract the pressure of our high steam, and they must therefore, have a force-pump.

To prove the boilers, it will be necesssry to have the safety valves loaded at double the pressure they ever intend to have them loaded when under a pressure of steam; the boilers must then be filled with water, and, by attaching a long lever to the force-pump, and the aid of three or four men to work it, the boilers can be tried at any pressure, by the water being forced into them until the double loaded valves shall be raised by the pressure of water contained in the boiler.

As it regards the high or low pressure engines, I conceive they are equally safe or equally dangerous: either of them depending on the method of proof—the two safety valves and a skilful and careful man employed about them as Engineer. For, as I have heretofore shewn, there is much depending on the Engineer be-

ing of that character. In high pressure engines the boilers are made to stand a pressure; and in the low pressure, it too frequently occurs they go far beyond the principle they have adopted, by working steam at a high pressure in large and unsafe boilers; the condensing of it is effected by shutting off steam from the cylinder, at a certain part of the motion of the engine, which, by exposure, becomes low enough to condense, although the steam is at a high pressure in the boilers, from which so many fatal accidents occur. For the safety of passengers, it would be practicable to make, of timber, a bulk-head or partition between the cabin and boiler, as the boilers generally burst at the end—although this might save the passengers it would not the crew. The method mentioned above of proving the boilers, and the two safety valves, with a capable and attentive Engineer, are the most certain bulwarks against all accidents.

P. S. I have used the method mentioned above of proving the boilers, and have affixed two safety valves on board of my boat.

I am, very respectfully,

Your obedient servant,

JOHN SHALLCROSS.

Master of steam-boat Favorite.

BEVERLY CHEW, Esq.

Report of a Select Committee of the House of Commons.

The Select Committee appointed to consider of the means of preventing the mischief of explosion from happening on board Steam Boats, to the danger or destruction of his Majesty's subjects on board such boats; and who were empowered to report their observations and opinion thereupon to the House; together with the minutes of the evidence taken before them; and to whom the petition of William Lester, Esq. was referred—have, pursuant to the order of the House, considered the matters to them referred, and agreed to the following Report:

Your Committee entered on the task assigned them with a strong feeling of the inexpediency of legislative interference with the management of private concerns or property, farther than the public safety should demand, and more especially with the exertions of that mechanical skill and ingenuity, in which the artists of this country are so pre-eminent, by which the labour of man has been greatly abridged, the manufactures of the country carried to an unrivalled perfection, and its commerce extended over the whole world.

Among these, it is impossible for a moment to overlook the introduction of steam as a most powerful agent, of almost universal application, and of such utility, that, but for its assistance, a very large portion

of the workmen employed in an extensive mineral district of this kingdom would be deprived of their subsistence.

A reference to the evidence taken before your Committee, will also show with what advantage this power has been lately applied, in Great Britain, to propel vessels both of burden and passage; how much more extensively it has been used in America, and of what farther application it is certainly capable, if it may not be said to be even now anticipated in prospect.

Such considerations have rendered your Committee still more averse, than when they entered on the inquiry, to propose to the House the adoption of any legislative measure, by which the science and ingenuity of our artists might even appear to be fettered or discouraged.

But they apprehend that a consideration of what is due to public safety, has, on several occasions, established the principle, that, where that safety may be endangered by ignorance, avarice, or inattention, against which individuals are unable, either from the want of knowledge, or of the power to protect themselves, it becomes the duty of parliament to interpose.

In illustration of this principle, many instances might be given; the enactments respecting party-walls in building, the qualification of physicians, pilots, &c. the regulations respecting stage coaches, &c. seem all to be grounded upon it. And your Committee are of opinion, that its operation may, with at least equal propriety, be extended to the present case, on account of the disastrous consequences likely to ensue from the explosion of the boiler of a steam engine in a passage vessel; and that the causes by which such accidents have generally been produced, have neither been discoverable by the skill nor controllable by the power of the passengers, even where they have been open to observation.

Your Committee find it to be the universal opinion of all persons conversant in such subjects that steam engines of some construction may be applied with perfect security, even in passage vessels; and they generally agree, though with some exceptions, that those called high pressure engines, may be safely used with the precaution of well constructed boilers, and properly adapted safety valves: and further, a great majority of opinions leans to boilers of wrought iron or metal, in preference to cast iron.

Your Committee, therefore, in consequence, have come to the following resolutions, which they propose to the consideration of the House:—

1. *Resolved*, That it appears to this Committee, from the evidence of several experienced engineers, examined before them, that the explosion in the Steam Packet at Norwich was caused not only by the improper construction and materials of the boiler, but the safety valve connected with it having been overloaded; by which the expansive force of the steam was raised to a degree of pressure beyond that which the boiler was calculated to sustain.

2. *Resolved*, That it appears to this Committee, that in the instances of similar explosions, in steam packets, manufactories, and other works, where steam engines were employed, these accidents were attributable to one or other of the causes above alluded to.

3. *Resolved*, That it is the opinion of this Committee, that, for the prevention of such accidents in future, the means are simple and easy, and not likely to be attended with any inconvenience to the proprietors of steam packets, nor with any such additional expense as can either be injurious to the owners, or tend to prevent the increase of such establishments. The means which your Committee would recommend are comprised in the following Regulations:—

That all steam packets carrying passengers for hire, should be registered at the port nearest to the place from or to which they proceed:

That all boilers belonging to the engines by which such vessels shall be worked, should be composed of wrought iron or copper:

That every boiler on board such steam packet should, previous to the packet being used for the conveyance of passengers, be submitted to the inspection of a skilful engineer, or other person conversant with the subject, who should ascertain, by trial, the strength of such boiler, and should certify his opinion of its sufficient strength, and of the security with which it might be employed to the extent proposed:

That every such boiler should be provided with two sufficient safety valves, one of which should be inaccessible to the engine man, and the other accessible both to him and to the persons on board the packet:

That the inspector shall examine such safety valves, and shall certify what is the pressure at which such safety valves shall open, which pressure shall not exceed one-third of that by which the boiler has been proved, nor one-sixth of that which, by calculation, it shall be reckoned able to sustain:

That a penalty should be inflicted on any person placing additional weight on either of the safety valves.

4. *Resolved*, That the chairman be directed to move the House, That leave be given to bring in a bill for enforcing such regulations as may be necessary for the better management of steam packets, and for the security of his Majesty's subjects, who may be passengers therein.